Implementing a Facility-Based Maternal and Perinatal Health Care Surveillance System in Afghanistan

Mary M. Dott, MD, Nasreen Orakail, MD, Hameeda Ebadi, MD, Filiberto Hernandez, MPA, MD, Kitty MacFarlane, CNM, MPH, Patricia L. Riley, CNM, MPH, Roberta Prepas, CNM, MN, and Brian J. McCarthy, MSc, MD

Afghanistan has one of the highest maternal and perinatal mortality rates in the world. Lack of a health information system presented obstacles to efforts to improve the quality of care and reduce mortality. To rapidly overcome this deficit in a large women's hospital, staff implemented a facility-based maternal and perinatal surveillance system known as "BABIES," which is specially designed for intervention and evaluation in low-resource settings. During a 12-month period, 15,509 deliveries resulted in 28 maternal deaths and a perinatal mortality rate of 56 per 1000 births. When stratified by birth weight and perinatal period of death, fetuses weighing at least 2500 g who died during the antepartum period contributed the most cases of perinatal death. This finding suggests that the greatest reduction in perinatal mortality would be realized by increasing access to high-quality antepartum care. Among fetuses weighing at least 2500 g, 93 deaths occurred during the intrapartum period. These deaths will continue to be monitored to ensure that the chosen interventions are improving intrapartum care for mothers and newborns. Because of its simplicity, flexibility, and ability to identify interventions, BABIES is a valuable tool that enables clinicians and program managers to prioritize resources. J Midwifery Womens Health 2005;50:296–300 © 2005 by the American College of Nurse-Midwives.

keywords: Afghanistan, surveillance, maternal mortality, perinatal mortality

BACKGROUND

Afghanistan, historically one of the poorest countries in the world, has been engaged in war for decades, resulting in a shattered health care and public health infrastructure, and worsening poverty and despair. The denial of Afghans' human rights, including access to health care,[1] was especially egregious for women and girls during the Taliban's regime.[2–4] During 1996 to 2001, Afghans were systematically denied access to health care, education, and employment. The prohibition of female education, coupled with the cultural preference that female health care providers care for women, resulted in a marginalized "at-risk" population receiving care from providers with the least education.

Approximately 1,600 Afghan women die due to maternal causes for every 100,000 live births. Maternal mortality ratios (Table 1) range from 400 per 100,000 live births in the district that holds Afghanistan's urban center, Kabul, to 6,500 per 100,000 live births in a remote mountainous district, Badakshan, which is the highest ever recorded in the world.[5] Even in Kabul Province, by far the least dangerous district in which to give birth in Afghanistan, the maternal mortality ratio is about 40 times higher than in developed countries.[6] Newborns, particularly children of deceased mothers, also do not fare well. Three of 4 children whose mothers die of maternal causes also die before their first birthday.[5]

Afghanistan's exceedingly high maternal and perinatal morbidity and mortality reflect a failed health care system. However, during the 2 years since the transitional government of Afghanistan has been in place, the Ministry of Health, with the support of UNICEF, USAID, US Department of Health and Human Services, and others has made an impressive commitment to improve the health of women and children. For example, the Afghanistan Ministry of Health has prioritized the creation and implementation of reproductive health programs, especially the provision of emergency obstetric care and family-planning services. Although midwives are being trained to provide basic reproductive health services at health posts and health centers, obstetricians will provide high-risk obstetric care, including cesarean births, at district hospitals.[7] Therefore, a large, full-service women's hospital, referred to as Women's Hospital in this article, was chosen as the initial site for integrating maternal and perinatal surveillance with clinical care. (Note: The facility's obstetric training program is supported through a special initiative within the US Department of Health and Human Services. Because of security concerns, the name of the hospital has been changed to protect patients, staff, and technical consultants.)

Initial efforts to remodel Women's Hospital and organize service delivery began in 2002. At that time, it was quickly recognized that the medical records and log books were inconsistently maintained and that essential patient data

Address correspondence to Patricia L. Riley, CNM, MPH, Office of Global Health, Centers for Disease Control and Prevention, Mail Stop D-69, Atlanta, GA 30333. E-mail: pyr0@cdc.gov

1526-9523/05/$30.00 • doi:10.1016/j.jmwh.2005.02.013

Table 1. Select Key Reproductive Health Indicators

Maternal mortality ratio	Annual number of maternal deaths per 100,000 live births
Perinatal mortality rate	Number deaths occurring during late pregnancy (at 22 or more completed weeks of gestation), during childbirth, and up to 7 completed days of life per 1000 total births
Infant mortality rate	Number of deaths occurring between birth and (exact age) 1 year per 1000 live births

Source: WHO, 2005.[17]

(e.g., number of patients seen per day, patient outcomes) were missing. As a result, the hospital staff and a local nongovernmental organization, with technical assistance from the US Centers for Disease Control and Prevention (CDC), implemented a surveillance system that accounted for mothers' and newborns' outcomes, and could influence decisions about resource allocation, staffing, and teaching priorities.

The tool chosen for data collection was the Birth weight and Age-at-death Boxes for Intervention and Evaluation System (BABIES).[8] BABIES is a maternal and perinatal surveillance system specially designed for use in low-resource settings; it relies on a table in which a minimum of data can be collected: birth weight, outcome (alive or dead), and perinatal period of death (antepartum, intrapartum, postpartum/neonatal). These data allow clinicians or program managers to estimate major contributors to maternal and perinatal deaths (for a population) without extensive postmortem investigation.[9] Linking mortality to birth weight and perinatal time frame can determine which intervention package[8] would have greatest impact in preventing adverse outcomes (Table 2).

In this article, we discuss the initial implementation of BABIES at a large women's hospital in Kabul, Afghanistan, as well as the use of the data collected to improve maternity and newborn care.

Mary Dott, MD, is a pediatrician working with the WHO Collaborating Center in Reproductive Health (WHO/CC), which is located in the Division of Reproductive Health at the Centers for Disease Control and Prevention (CDC).

Nasreen Orakail, MD, is an obstetrician/gynecologist and the director of the Afghan Ministry of Health's Rabia Balkhi Hospital in Kabul.

Hameeda Ebadi, MD, is the local project director for the WHO/CC's activities in Afghanistan.

Filiberto Hernandez, MD, MPA, is the project director leading health activities in Afghanistan for CDC's WHO/CC.

Kitty MacFarlane, CNM, MPH, is a nurse-midwife leading the midwifery training components in Afghanistan for CDC's WHO/CC.

Patricia L. Riley, CNM, MPH, is a nurse-midwife and senior policy advisor within CDC's Office of Global Health, who collaborated on this project.

Roberta Prepas, CNM, MN, JD, is a nurse-midwife consultant who helped to implement perinatal surveillance in Afghanistan.

Brian J. McCarthy, MSc, MD, is the principal investigator of CDC's WHO/CC.

METHODS

The BABIES surveillance system was chosen because of its simplicity, low cost, flexibility, potential to be expanded to regional or national level surveillance activities, and potential to be combined with more detailed medical record data as the hospital health management information system improves. Women's Hospital quality assurance teams were created to implement the surveillance system, select the best possible interventions, and evaluate whether the chosen intervention(s) had the expected impact on reducing mortality. CDC staff provided technical support. Workshops introducing Afghan hospital staff to the use of BABIES were conducted during the first week of November 2003. Afghan surveillance staff consisting of a nurse-midwife and a physician received in-depth, ongoing training in implementation and use of BABIES. Afghan health care workers document outcomes daily by using BABIES tables in the delivery room, surgical area, and nursery. Surveillance staff collects the tables daily and checks their accuracy against existing logs, medical records, and staff reports. Surveillance staff aggregate the data in an Excel spreadsheet monthly, which a CDC technical advisor reviews. After the data are reviewed for reliability, they are reported to interested parties, particularly hospital-based quality assurance teams.

RESULTS

During the initial 12-month period of data collection, Women's Hospital recorded 15,509 deliveries. Twenty-eight mothers died during the perinatal period. Of these 15,509 deliveries, 14,637 (94%) infants were alive at the time of discharge from the hospital (range was several hours to a week or more after delivery). During this time, 872 perinatal deaths occurred, resulting in an overall perinatal death rate of 56 per 1000 births (Table 3). The low birth weight ($<$2500 g) proportion among women delivering at Women's Hospital was 16%.

Birth weight-specific mortality can be calculated to answer the question, "Are we doing things correctly?" The birth weight-specific perinatal mortality rate (i.e., the number of perinatal deaths among infants of a predetermined birth weight group divided by the total number of births of infants in that birth weight group) was determined. Fetuses and infants less than 1500 g at birth had a perinatal mortality rate of 534 per 1000 births. The perinatal mortality rate among fetuses and infants who weighed between 1500 and 2499 g was 134 per 1000 births, and the perinatal mortality rate among fetuses and infants 2500 g or greater was 26 per 1000 births. Birth weight-specific mortality is most useful when it is followed over time to determine if implemented interventions are having the desired effect in reducing mortality within a given birth weight group.

In contrast, the intervention package proportionate mortality rate is used to decide which intervention package, if implemented correctly, has the potential to lead to the largest reduction of deaths for the entire population, or answer the question, "Have we chosen the right things to do?" To

Table 2. Sample Intervention Packages by Perinatal Time Period

I. Prepregnancy health 1. Family planning 2. Diagnose and treat anemia 3. Prevent and treat STIs and HIV 4. Tetanus toxoid immunization 5. Adequate micronutrients and calories for girls and prepregnant women	III. Care during delivery 1. Skilled attendant 2. Early recognition of danger signs 3. Use of partograph 4. Access to emergency obstetric care	V. Newborn care 1. Clean delivery 2. Maintain warmth 3. Early and exclusive breastfeeding 4. Eye and cord care
II. Care during pregnancy 1. Birth planning 2. Tetanus toxoid immunization 3. Antenatal care 4. Adequate nutrition, micronutrient supplementation 5. Treat STIs	IV. Maternal postpartum care 1. Active management of third stage of labor 2. Home postpartum care 3. Recognition of danger signs 4. Access to emergency care 5. Family planning	

STI = sexually transmitted infections.

calculate intervention package proportionate mortality rates (i.e., the number of deaths associated with a given intervention package divided by the total number of births), cells in the table must be grouped in a manner that associates deaths with the interventions most likely to prevent those deaths. For example, the intervention package (prepregnancy health) proportionate mortality rate among fetuses and infants less than 1500 g at birth was 19 per 1000 births. Therefore, of all the perinatal deaths that occurred among these hospitalized women, up to 19 per 1000 might have been prevented had prepregnancy interventions been optimized. As a group, these infants would have benefited most from improved prepregnancy maternal health (e.g., diet supplementation or adequate child spacing). For fetuses whose death occurred before the onset of labor and who weighed 1500 g or greater, the intervention package (antepartum care) proportionate mortality rate was 24 per 1000 births. As a group, these infants would have benefited most from improved prenatal care (e.g., infectious disease screening and treatment or early identification of high blood pressure). The intervention package (intrapartum care) proportionate mortality rate among fetuses 1500 g or greater who died after the onset of labor but before delivery was 9 per 1000 births. Many of these deaths are preventable with improved intrapartum care, including early recognition of complications and definitive treatment, such as cesarean births. Finally, the intervention package (neonatal care) proportionate mortality rate among neonates 1500 g or greater at birth was 5 per 1000 births. This group would have benefited most from improved early neonatal care, including adequate neonatal resuscitation, early identification and treatment of infected neonates, careful attention to maintaining warmth, and early exclusive breastfeeding. High-quality intrapartum care, including obstetric procedures to prevent asphyxiated newborns, is also important for reducing mortality among this group. Therefore, among all perinatal deaths that occurred in this population, the largest contributor to overall mortality occurred among fetuses that would have most benefited from improved antepartum care (Figure 1).

DISCUSSION

> *"Surveillance information tells the health officer where the problems are, whom they affect, and where programmatic and prevention activities should be directed"*[10]

Reproductive outcome surveillance using the BABIES tool has been implemented in many settings. The system has been used to monitor and improve health outcomes in rural villages in Tanzania,[11] as well as to analyze national data in Uganda,[12] Kazakhstan,[13] and Greece.[14] To our knowledge, this is the first report of its use in facility-based management and the first attempt to do so in Afghanistan.

Table 3. Number of Perinatal Deaths by Birth Weight and Time of Death, Women's Hospital, Kabul, Afghanistan, 2004

	Perinatal Period of Death				
Birth Weight (g)	**Antepartum* (n)**	**Intrapartum† (n)**	**Neonatal‡ (n)**	**Alive at Discharge (n)**	**Total (N)**
<1500	186	26	77	252	541
1500–2499	148	39	47	1,513	1,747
≥2500	220	93	36	12,872	13,221
Total	554	158	160	14,637	15,509

*Macerated stillbirth.

†Fresh stillbirth.

‡Prior to discharge.

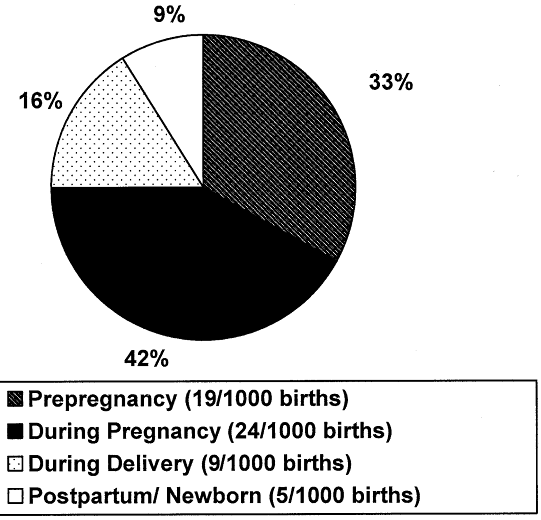

Figure 1. Maximum potential reduction of perinatal mortality by intervention package—Women's Hospital, Kabul, Afghanistan, 2004.

In established health systems, health service surveillance is almost always conducted by reviewing and collecting information from medical records that detail patients' conditions, treatments, and outcomes. In this instance, because Women's Hospital medical records needed revision and the staff needed time for training and piloting a new, functional medical record, the hospital staff chose to first implement BABIES so that data would be immediately available to program planners while medical record systems were being created, implemented, and evaluated. Maternal and perinatal surveillance tools, such as BABIES, draw attention to high-need groups when used in combination with other methods, such as maternal and perinatal death reviews, focus groups, and quality assurance committees.[15] Collectively, these tools enable program planners to select the best course of action. On selecting a specific maternal and perinatal intervention, BABIES can then be used to assess whether the intervention had the intended impact.

Women's Hospital surveillance data during a 6-month period revealed important trends that need to be taken into account to effectively allocate resources. First, 16% of women accessing services deliver infants with low birth weight. It has been estimated that Afghanistan had a low birth weight proportion of about 20%.[16] Although there are epidemiologic challenges in comparing a facility-based low birth weight rate with that of a population, it is notable that the low birth weight rate in developed countries is about 6% and mostly represents premature births.[16] In developing countries, a much larger proportion of low birth weight babies are growth retarded. These data suggest that the health of mothers who access services in Women's Hospital, although perhaps somewhat better than most Afghan women, is quite poor. This finding is not surprising considering the status of women in Afghanistan, the health and sanitation infrastructure, and the poverty level of most Afghan citizens. Data from the surveillance system revealed that the 2 groups that contributed most to all perinatal deaths at this hospital were fetuses and infants who weighed less than 1500 g (those in the prepregnancy intervention group) and fetuses who weighed 1500 g or greater and died during the antepartum period (those in the care during pregnancy intervention group) (Table 3). Therefore, interventions directed at the general health status of women and girls and care of pregnant women before the onset of labor or arrival at the hospital are likely to have the greatest impact on perinatal health.

In a facility that provides emergency obstetric care, understanding every maternal death, usually through maternal death review, is important in identifying specific opportunities to improve care. However, because maternal deaths occur so rarely, monitoring their numbers will not reveal whether implemented changes have had the anticipated impact in a timely manner. For this reason, the availability and quality of emergency obstetric care can be monitored by observing the number of stillbirths who weighed 2500 g or greater and died during the intrapartum period. Most of these infants died of conditions that, if allowed to progress, would have caused the death of the mother (e.g., obstructed labor leading to asphyxia in the newborn and hemorrhage in the mother, infection in both the mother and the baby, and eclampsia causing asphyxia of the newborn and mother). Deaths to fetuses in this group can be considered "near-miss" maternal deaths. The frequency of these deaths, as well as their details, should be reviewed to estimate the availability and quality of intrapartum obstetric care and look for opportunities for improvement.

As a result of these findings, the Women's Hospital quality assurance teams will have to assess several factors to determine which interventions to implement and evaluate. The goal of these teams will be to determine what changes will best ensure that a qualified person monitors and responds, if needed, to a patient's condition with appropriate interventions in a timely manner. Factors, such as the cost of the intervention, its cultural acceptability, and the presence of an available health infrastructure to support the intervention must also be considered. Women's Hospital currently provides no formal antenatal care. Antenatal services are provided by several nongovernmental organizations; however, there is no formal linkage with Women's Hospital. In this setting, despite the fact that most perinatal deaths occurred among the group that would benefit most from improved antenatal care, it may be more realistic to initially address intrapartum management because it occurs within the walls of the hospital and may be more amenable to intervention. However, if perinatal mortality in this population is to be reduced to any significant degree, programs aimed at improving antenatal care and women's health must be implemented.

These data are subject to several limitations. Although this surveillance tool can help to identify high-impact intervention packages that will help reduce perinatal mortality, it is somewhat limited in the ability to identify interventions to reduce maternal mortality, particularly those deaths that occur during the postpartum period. The major causes of death for both mothers and babies in the antepartum and intrapartum periods are similar, albeit the mother is affected less frequently than the baby. However, pathologic processes that begin in the postpartum period and affect only the mother (such as postpartum hemorrhage due to uterine atony) are not reflected by recording perinatal deaths. At Women's Hospital, surveillance data are supplemented with maternal adverse event reviews to ensure that postpartum near-miss events, such as postpartum hemorrhage, are not overlooked. Other limitations of the system include its inability to capture deaths that occur after discharge from the hospital because of lack of follow-up of patients. For example, data from Women's Hospital show that 252 (47%) of 541 babies who weighed less than 1500 g were discharged from the hospital alive. At this birth weight, it is likely that many of these children died either at home or at other facilities, as there are no neonatal intensive care units in Afghanistan capable of providing the ventilatory and other high-tech support that most children in this weight group require. In addition, for many of the neonates who died, the perinatal period of death had to be estimated. For example, if the mother arrived at the hospital in labor and delivered a stillborn, it was difficult to determine whether the baby died during the antepartum or intrapartum period. We estimated the perinatal period of death by observing whether the infant was macerated at birth. If the infant was macerated at birth, it had been dead for at least 24 hours. In these cases, we estimated that the deaths occurred during the antepartum period. However, we recognize that this method is subject to some misclassification. Finally, the intervention packages identified as having the greatest potential to reduce mortality must be reviewed by people familiar with the group of women being treated to ensure that they are relevant among those women. The most effective intervention(s) are best determined by people who are familiar with the health and practices of local women and who have access to reliable data to support their opinions.

CONCLUSION

Afghan health care providers working at Women's Hospital have successfully implemented a simple and flexible surveillance system in their hospital. The data from this system are being used in combination with other information to prioritize, implement, and evaluate interventions aimed at reducing maternal and perinatal mortality among women and infants being cared for at this hospital. As a health management information system becomes institutionalized, the surveillance system will begin to gather information in a more formalized way. The combination of data from the future health management information system and the surveillance system currently in place will enable planners to prioritize available interventions and monitor their impact.

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